MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2210)

DSA5541 – DATA STRUCTURE AND ALGORITHMS

(DIT Group)

14 FEBRUARY 2023
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT:

1. This question paper consists of **NINE (9)** pages excluding the cover page. There are **TWO (2)** sections in this booklet.

2. **SECTION A**: Answer all questions in the answer booklet provided.

3. **SECTION B**: There are **THREE (3)** questions in this section. Answer all questions in the answer booklet provided.

SECTION A (10 Marks)

Instruction: *Write your answers in the answer booklet provided.*

1. Representing of data structure in memory is known as:

   A. recursive.
   B. storage structure.
   C. abstract data type.
   D. file structure.

2. Assume that the *num* is 3 and the *name* inserted are "Liyana", "Marissa" and "Mia". What is the output for the following code in the Figure 1?

```
#include<iostream>
using namespace std;
int main()
{
    int num; string *name;
    cout<<"How many student take DSA5541 subject : ";
    cin>>num;
    name = new string[num];
    for(int i=0; i<=num-1; i++)
    {
        fflush(stdin);
        cout<<"Enter your name : ";
        getline(cin,name[i]);
    }
    int i=num-1;
    do
    {
        cout<<name[i]<<" ";
        i--;
    }while(i>=0);
}
```

Figure 1

   A. Liyana Marissa Mia.
   B. Marissa Mia Liyana.
   C. Mia Marissa Liyana.
   D. Liyana Mia Marissa.

Continued.....

3. Which of the following statements is FALSE for function passing by reference?

A. Address of the actual parameter passes to the function.
B. Requires less memory.
C. Requires more time as it involves copying values.
D. Changes made inside the function is reflected in the original value.

4. What is the output for the following code in the Figure 2?

```
int main()
{
    int *p, *r, a=3, b=8;
    p=&a;
    r=&b;
    for(int i=0; i<3; i++)
    {
        *p = a + (*r)++;
    }
    cout<<"*p = "<<*p<<", *r = "<<*r<<", a = "<<a<<",
b = "<<b;
}
```

Figure 2

A. *p = 30, *r = 10, a = 30, b = 10.
B. *p = 30, *r = 11, a = 30, b = 11.
C. *p = 27, *r = 8, a = 27, b = 8.
D. *p = 20, *r = 10, a = 20, b = 10.

5. Which of the following features is FALSE for the stack?

A. Dynamic data structure.
B. Do not have a fixed size.
C. Do not consume a fixed amount of memory.
D. Insertion at one end rear and deletion at another end front.

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6. Which of the following diagram is TRUE after the code is executed in the Figure 3?

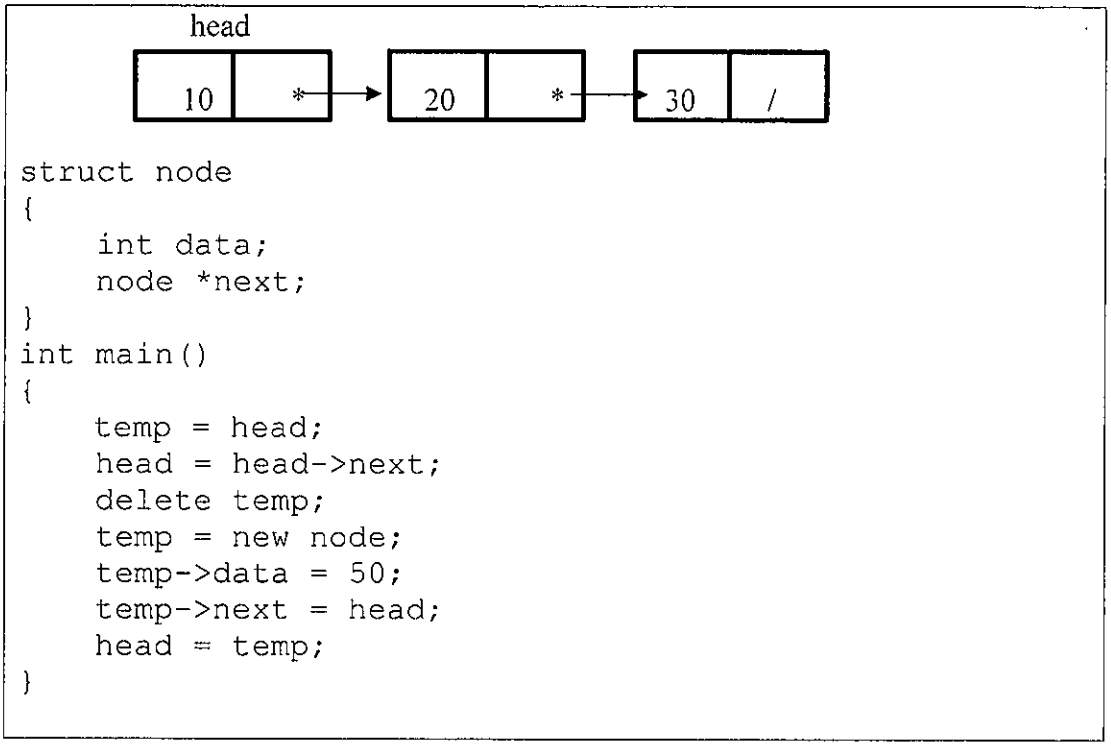
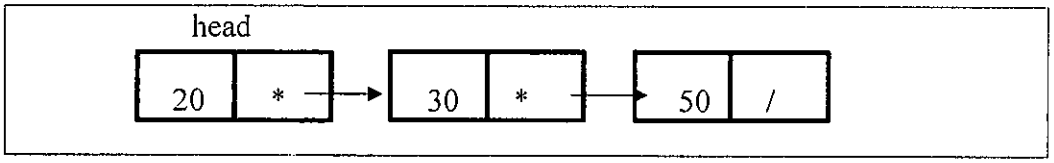
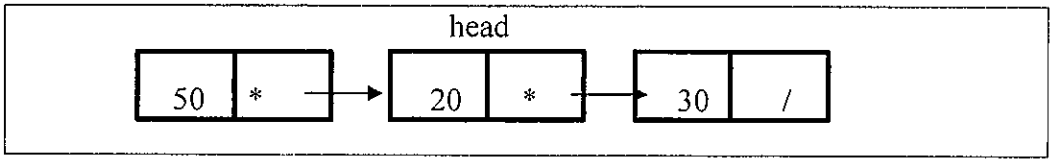


Figure 3

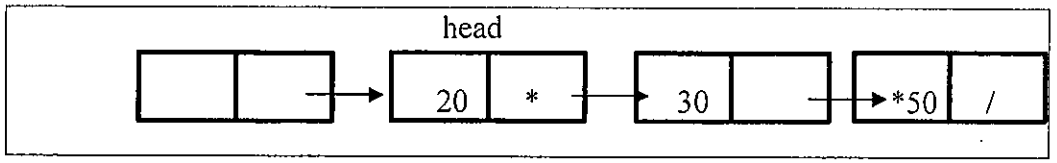
A.



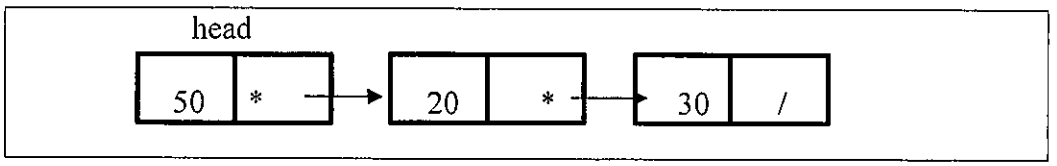
B.



C.



D.



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7. The loop statement in the figure 4 is for Binary Search algorithm. What is the suitable code in section (i)?

```
while( (found==0) && (first <= last) )
{
        mid = (first + last) / 2;
        if( target == table[mid])
            found = 1;
        else
        {
            .....section(i).....
                last = mid - 1;
            else
                first = mid + 1;
        }
}
```

Figure 4

A. `while( target>table[mid])`
B. `if( target>table[mid])`
C. `if( target<table[mid])`
D. `while( target<table[mid])`

8. The number of interchanges required to sort 2, 8, 3, 1, 9, 11 in descending order using Bubble Sort is

A. 10
B. 8
C. 9
D. 11

Continued.....

9. Evaluate the following Binary Tree in the figure 5. Given are integers A is 3, B is 6 and C is 2.

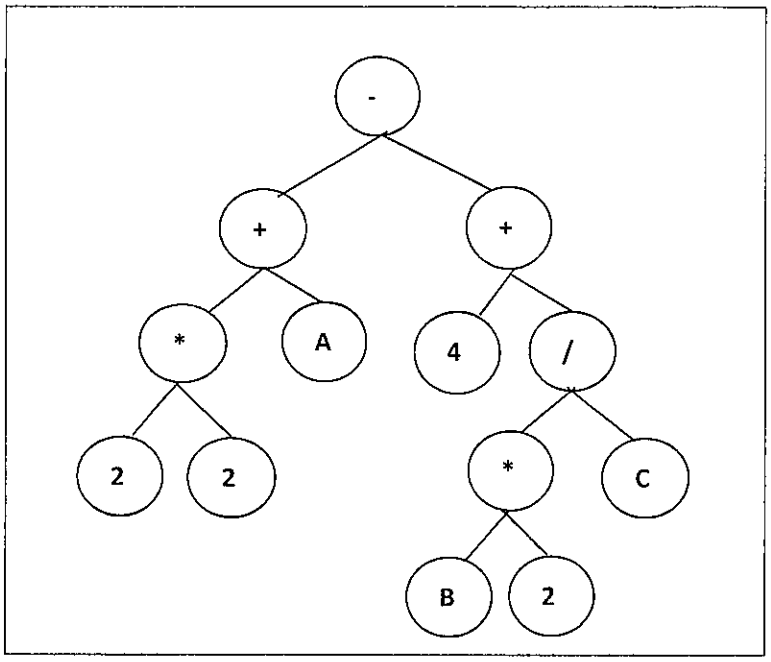


Figure 5

A. 3
B. 2
C. -2
D. -3

10. 43, 22, 10, 18 and 30 are the keys to be stored in an array of size 8 using hash function. Which of the following is the correct answer using Linear Probing technique to solve the collision?

A.

0	1	2	3	4	5	6	7
		10	43	18		22	30

B.

0	1	2	3	4	5	6	7
18		10	43			22	30

C.

0	1	2	3	4	5	6	7
18	30	10	43			22	

D.

0	1	2	3	4	5	6	7
		10	43		18	22	30

Continued.....

SECTION B (30 Marks)

Instruction: *Write your answers in the answer booklet provided.*

QUESTION 1 (10 Marks)

a. Convert and evaluate the following expression. Given an integer ***m=4***, ***n=2***, ***x=3*** and ***y=6***. Show the steps in getting the final value. [4 marks]

i. - + y * m 4 – 6 % + y x n

ii. + * % m 3 x * * / y n n x

b. Write a sequence of C++ programming codes based on the diagram given. Assume that the node consists of two members, ***data*** and ***next*** which are data type integer and node pointer respectively shown in the figure 6.

```
struct node
{
  int data;
  node *next;
 }*head, *tail, *temp;
```

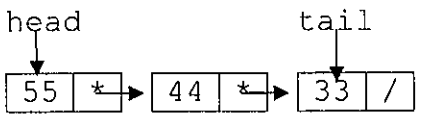
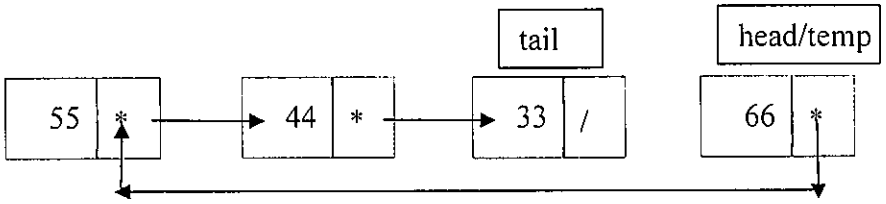
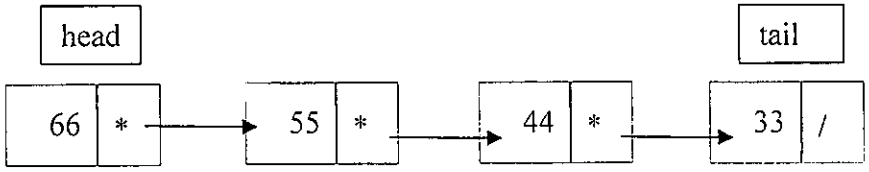


Figure 6

i. Create a new node that has data 66 and link the new node to the node 55. [2 marks]



ii. Write a code to print out the linked list. [2 marks]



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c) Write a code segment for a function *serve()* in the linked queue. Given is a structure *node* as a reference. Write a code based on illustration diagram shown in the Figure 7. [2 marks]

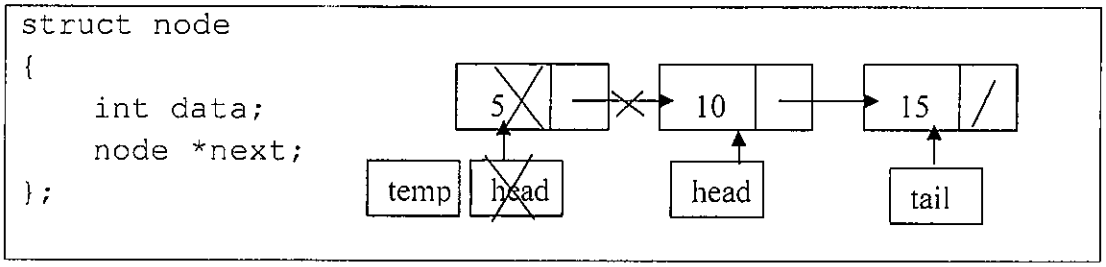

Figure 7

```
int serve()
{
    int num;
    if(!empty())
    {
        .....
        .....
        if (front == NULL)
           rear = NULL;
        return num;
    }
    else
    {
        cout<<"Queue is Empty";
        return 0;
    }
}
};
```

Continued.....

QUESTION 2 (10 Marks)

a. By using binary search algorithms, show all the steps in searching data **75** from list given. [6 marks]

44, 35, 23, 63, 50, 100, 73

b. Write a complete C++ code to calculate the truncation of 9 digits integer using folding method to determine the index location of hash table based on the instruction given. [4 marks]

- Prompt user to enter 9 digits input.
- Divide the 9 digits integer into 3 sub-groups with each has 3 values.
- Minus the first 2 groups and add the third group.
- Truncate the first digit from the result.

Sample Output

`Enter 9 digits integer value : 628144453`
`Group 1 : 628`
`Group 2 : 144`
`Group 3 : 453`
`Truncation for 628144453 is : 37`

Continued.....

QUESTION 3 (10 Marks)

a. Given an array contains the elements shown in the diagram below. By using **Insertion Sort,** sort the following sequence of number in **descending order.** Draw the sequence of diagram to depict the process and write the number of interchanges required to sort the data. [3 marks]

88	23	72	140	63	44	56	33

b. Draw a binary tree for the algebraic expression shown below: [4 marks]

[A + 3 % B] + [2 * C] * [D – 2 / E]

c. Derive the adjacency list from the graph given in the figure 8 below. [3 marks]

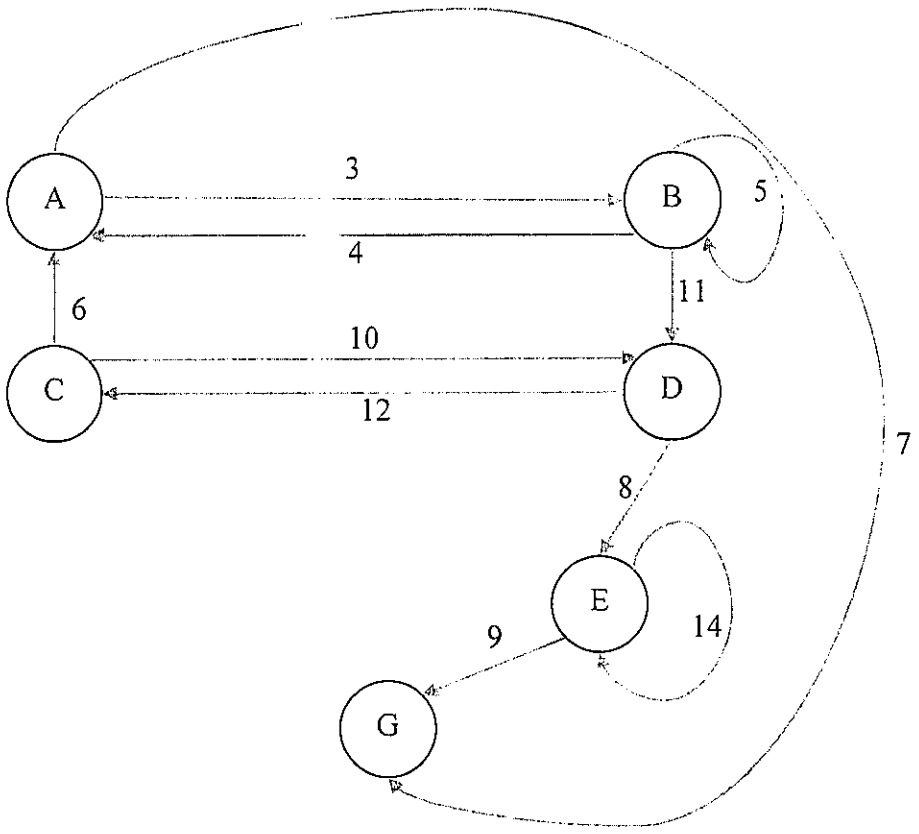

Figure 8

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